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Three-dimensional imaging and three-dimensional coordinate gathering in three-dimensional optical micromanipulation system

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We present a low cost three dimensional (3D) imaging solution in our three dimensional micromanipulation system. The imaging solution is capable of deducing 3D coordinates for multiple objects simultaneously in real time. The method described works with a single camera and a low cost, commercially available LED based projector. A variant of this method can be used to make stereoscopic images which the human brain can decode as a 3D structure by help of red/blue stereoscopic glasses.

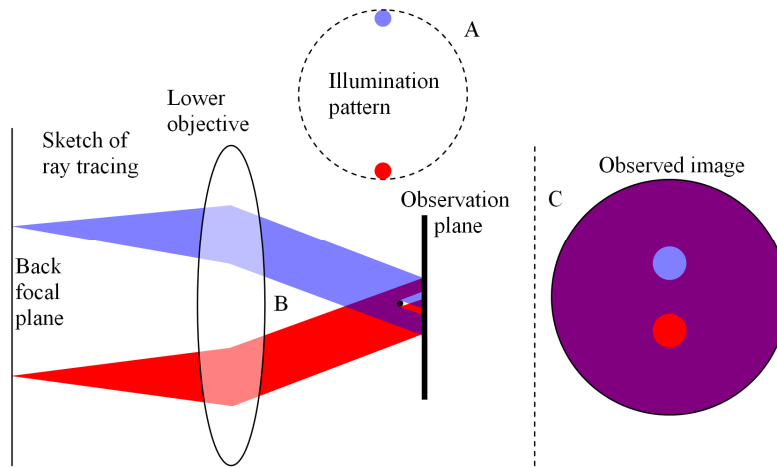


Figure 1: Angled illumination with different colors is used to make dual images of out of focus objects. The displacement between these colored shadows is proportional to the out of focus position.

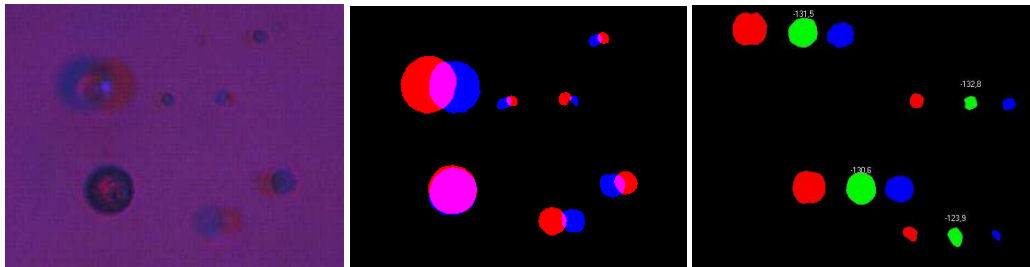


Figure 2: Stereoscopic images of an assembly of trapped beads of various sizes. Second image shows image analysis of the first actual image. The last image shows how the analyzed image looks when a centered green illumination is added to the illumination seen in Fig. 1.